

-- 8. The apparatus for fabricating a thermoelectric material as defined in claim 1, further including a stem supporting the rotating disk. -- (22)

B2 -- 9. The apparatus for fabricating a thermoelectric material as defined in claim 8, wherein the stem and the rotating disk have a uniform integral structure made of silicon nitride or a material containing silicon nitride. -- 7

REMARKS

In the foregoing amendments, claim 1 was amended to further define that the disk has a uniform structure, such as shown in Fig. 4A and described applicant's specification disclosure. Editorial changes are also made to claim 1. Claims 5-9 were added to the application were amended. Claims 5 and 6 further define the means for pouring the molten metal of the heat-melted raw material respectively includes a funnel or a pouring port. New claim 7 defines that the disk is made of β -sialon, as described on page 15 of applicant's specification disclosure. Claim 8 further defines that the apparatus includes a stem supporting the disk, and new claim 9 further defines that the stem and disk have a uniform integral structure made of silicon nitride or a material containing silicon nitride.

Claims 3 and 4 were withdrawn from consideration has being directed to a non-elected invention. Accordingly, claims 1, 2, and 5-9 are in the application for consideration by the examiner.

Attached hereto is a marked-up version of the changes made to claim 1 by the current amendment. The attached page are captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

The Official action set forth a single rejection of claims 1 and 2 under 35 U.S.C. § 102(b) as being anticipated by either U.S. Patent No. 4,374,074 of Ueda *et al.* (Ueda '074) or U.S. Patent No. 4,315,720 of Ueda *et al.* (Ueda '720). This rejection is set forth in the paragraph bridging pages 2 and 3 of the Official action. The disclosures in Ueda '074 and Ueda '720 are identical and hereinafter they will be referred to collectively as the Ueda patents.

Applicant respectfully submits that the teachings of the Ueda patents do not disclose or suggest the invention as set forth in claims 1, 2, and 5-9 within the meaning of 35 U.S.C. § 102(b) or 35 U.S.C. § 103.

The Official action stated the Ueda patents disclose that the rotating disk can be made entirely of silicon nitride, noting column 2, lines 31-37, of either Ueda patents. However, applicant respectfully submits that the Ueda patents do not contain such a teaching. In fact, the Ueda patents propose that the disk is made of a plurality of materials, only one of which can be silicon nitride.

The Ueda patents explain that the disk plate, which is a block of a refractory material, is stuck to a heat-insulated fire brick layer (See col. 2, lines

31-54). The bottom surface of the heat-insulated fire brick layer is stuck to a mat of heat-insulating fiber materials; and the aforesaid block, heat-insulating fire brick and the mat of heat-insulating materials are set in a holder of heat-resisting steel consisting of a side ring and a bottom plate. The side ring has a plurality of protuberances on its inside wall at regular intervals, while the block has a plurality of rules on its outer peripheral wall corresponding to the protuberances on the inside wall of the ring, etc. At column 2, lines 55-60, the Ueda patents describe the structure of the block, which is shown in Figs. 8B and 8C. From these teachings, it is readily apparent that the Ueda patents propose a disk made from multiple layers of different materials. In other words, the teachings of the Ueda patents do not remotely contemplate or suggest a disk having an integrated or uniform structure, where it is made of a single material and structure, as required in present claim 1 .

It is noted that Figs. 1 and 2 in the Ueda patents may show what appears to be a disk made from a single material. However, this showing in Figs. 1 and 2 of Ueda does not accurately describe or show the disk proposed therein, but is only identifying the disk surface for explanation purposes. For example, the disk 2 is hatched for metal and does not contain all the additional layers described elsewhere in the Ueda patents as necessary. For all these reasons, applicant respectfully submits that the teachings of the Ueda patents do not contemplate or suggest an apparatus for fabricating a thermoelectric material comprising, *inter alia*, a rotating disk having a uniform structure made

of silicon nitride or a material containing silicon nitride for scattering the poured molten metal, as required in present claim 1.

The present inventors discovered that by using silicon nitride or a material containing silicon nitride, which is light and strong, a uniform rotating disk can be made. This structure of applicant's claimed invention solves difficulties in the prior art. For example, the disk uniformly made of silicon nitride of applicant's claims is lightweight and strong, so that it can be rotated at a high speed without breaking. Rotating the disk at a high-speed enables thermoelectric material of a small grain size to be fabricated. In addition, the disk uniformly made of silicon nitride of applicant's claims has a low heat capacity, so that the molten metal of a thermoelectric material poured thereon is not deprived of its heat by the disk. This prevents the molten metal from solidifying on the rotating disk.

In addition, it is respectfully noted that in addition to silicon nitride, the teachings of the Ueda patents proposed the use of many other refractory materials, such as fused silicon, graphite, silicon carbide, zircon, alumina, and magnesia. In the comparative testing described on pages 16-18 of applicant's specification disclosure these other materials proposed by the Ueda patents were compared to the silicon nitride disk of applicant's claims. Initially, it is respectfully noted that for many of the materials, such as boron nitride and graphite, which are fragile, a holder made of titanium was attached to the disk. See, for example, Comparative Examples 7-10 and Fig. 5 of the present

specification disclosure. Accordingly, these materials could not be made into a disk or a disk and stem of integral uniform structure as required in the present claims.

From the showing in Fig. 5 of the present application, materials other than those as set forth in the present claims for the disk, including many of those proposed by the Ueda patents, did not satisfactorily obtain a powder yield of the molten material composition in contrast to the materials of applicant's claims. Accordingly, ~~applicant respectfully submits that the~~ showing in Fig. 5 of the present application demonstrates the unexpected advantages of a disk having uniform structure of silicon nitride or silicon nitride material in an apparatus for fabricating a thermal electric material, as required in the present claims.

The teachings of the Ueda patents do not contemplate or suggest a rotating disk having a uniform structure made of silicon nitride or a material containing silicon nitride for scattering the poured molten metal, as required in present claims or the advantages achieved by such a disk in an apparatus for fabricating a thermoelectric material comprising, as described above. Therefore, applicant respectfully submits that the presently claimed invention is patently distinguishable from these teachings.

Claim 7 defines that the disk is made of β -sialon. Claim 8 defines that the apparatus includes a stem supporting the disk, and new claim 9 further defines that the stem and disk have an uniform integral structure made of

silicon nitride or a material containing silicon nitride for scattering the poured molten metal. The teachings of the Ueda patents do not contemplate or suggest these additional structures in applicant's claims.

For the foregoing reasons, applicant respectfully submits that the invention set forth in claims 1, 2, and 5-9 is patently distinguishable from the teachings of the Ueda patents within meaning of 35 U.S.C. § 102 or 35 U.S.C. § 103. Therefore, applicant respectfully requests that the examiner reconsider and withdraw this rejection.

In view of the foregoing amendments and remarks, favorable consideration and a formal allowance of claims 1, 2, and 5-9 are respectfully requested. While it is believed that the present response places the application in condition for allowance, should the examiner have any comments or questions, it is respectfully requested that the undersigned be telephoned at the below listed number to resolved any outstanding issues.

In the event this paper is not timely filed, applicant hereby petitions for an appropriate extension of time. The fee therefor, as well as any other fees which may become due, may be charged to our deposit account No. 22-0256.

Respectfully submitted,
VARNDELL & VARNDELL, PLLC

A handwritten signature in black ink, appearing to read "R. Eugene Varndell, Jr.", written over a horizontal line.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claim 1 was amended as follows:

-- 1. (Amended) An apparatus for fabricating a thermoelectric material comprising:

a container for mixing and heat-melting raw material having a predetermined composition;

means [a funnel or a pouring port] for pouring the molten metal of the heat-melted raw material; and

a rotating disk having a uniform structure made of silicon nitride or a material containing silicon nitride for scattering the poured molten metal. --